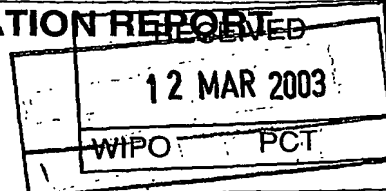


PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT (PCT Article 36 and Rule 70)



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| Applicant's or agent's file reference BW244R/REPA/rrr | FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/PEA/416) | |
| International application No. PCT/IT 02/00464 | International filing date (day/month/year) 16.07.2002 | Priority date (day/month/year) 16.07.2002 |
| International Patent Classification (IPC) or both national classification and IPC G08B17/12 | | |
| Applicant GS GESTIONE SISTEMI S.R.L. et al. | | |

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 4 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

 These annexes consist of a total of 6 sheets.

3. This report contains indications relating to the following items:
 - I ☒ Basis of the opinion
 - II ☐ Priority
 - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
 - IV ☐ Lack of unity of invention
 - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
 - VI ☐ Certain documents cited
 - VII ☐ Certain defects in the international application
 - VIII ☐ Certain observations on the international application

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| Date of submission of the demand 15.01.2004 | Date of completion of this report 05.10.2004 |
| Name and mailing address of the International preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465 | Authorized Officer Wille, H-J Telephone No. +49 89 2399-6725 |

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. **PCT/IT 02/00464**

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, Pages

2-13 as originally filed
1, 1a received on 23.06.2004 with letter of 21.06.2004

Claims, Numbers

1-31 filed with telefax on 16.09.2004

Drawings, Sheets

1/4-4/4 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
☐ the language of publication of the international application (under Rule 48.3(b)).
☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
☐ filed together with the international application in computer readable form.
☐ furnished subsequently to this Authority in written form.
☐ furnished subsequently to this Authority in computer readable form.
☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. **PCT/IT 02/00464**

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

| | | |
|-------------------------------|-------------|------|
| Novelty (N) | Yes: Claims | 1-31 |
| | No: Claims | |
| Inventive step (IS) | Yes: Claims | 1-31 |
| | No: Claims | |
| Industrial applicability (IA) | Yes: Claims | 1-31 |
| | No: Claims | |

2. Citations and explanations

see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/IT 02/00464

The application relates to an environment monitoring system comprising an unmanned ground local device which detects critical thermal variations in an observed area. In a central control station actually available fire fighting resources are stored and processed together with the data concerning the thermal variations in order to create an intervention plan. Meteorological data are processed as well.

Such a system is known from US2002/0026431 which is regarded as closest prior art. The subject-matter of claim 1 distinguishes from D1 by activating the camera for transmitting visible images in response to a detected infrared energy emission of a predetermined threshold value.

The differing feature increases the autonomy of the system which is at the same time more cost effective. None of the documents cited in the ISR proposes such a measure so that the subject-matter of claim 1 and related method claim 23 involve an inventive step. Dependent claims 2 to 22 and 24 to 31 include all features of the claims they are referred to and are likewise based on an inventive activity.

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CLAIMS

1. An environment monitoring system (100), comprising:
 - at least a local device (1), apt to be installed in the environment to be monitored and having acquisition means (7, 8, 9, 10) for acquiring environmental data apt to detect critical thermal variations in the area of interest;
 - a central control station (101), comprising storage means (102) for storing logistical-technical data and data about the available intervention means pertaining to the monitored environment;
 - means (12) for transmitting/receiving data, for bilateral communication between said central control station (101) and said at least one local device (1); and
 - means (103) for the integrated processing of the environmental data acquired by said at least one local device (1) and of the data contained in said storage means (102), apt to provide as their output a model of evolution of the thermal front consequent to a critical thermal variation and an intervention plan for limiting the damages associated therewith.
2. The system (100) as claimed in claim 1, comprising a plurality of local devices (1) apt to be installed in the environment to be monitored.
3. The system (100) as claimed in claim 1 or 2, wherein said acquisition means of said one or more local devices (1) comprise detection means (9) for detecting energy emissions in the infrared range.
4. The system (100) as claimed in the previous claim, comprising means (17) for processing the energy emissions detected by said detection means (9) apt to analyse said emissions on a plurality of emission bands.
5. The system (100) as claimed in any of the previous claims, wherein said acquisition means of said one or more local devices (1) comprise image acquisition means (7).
6. The system (100) as claimed in the previous claim when dependent on claim 3 or 4, wherein said detection means (9) comprise at least a thermo-camera operating in the infrared range.
7. The system (100) as claimed in the previous claim, wherein said thermo-camera is provided with an infrared micro-bolometric sensor.
8. The system (100) as claimed in any of the claims from 5 a 7, wherein said image acquisition means (7) comprise at least a telecamera (8) that operates in the visible range.
9. The system (100) as claimed in the previous claim when dependent on claim 3 or

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4, wherein said detection means (9) are apt to determine the activation of said telecamera (8) in response to the detection of energy emissions of a predetermined entity.

- 5 10. The system (100) as claimed in any of the claims from 5 to 9, wherein said means (12) for transmitting/receiving data are able to transmit images from said one or more local devices (1) to said central control station (101) in a visible and/or infrared mode.
- 10 11. The system (100) as claimed in any of the previous claims, wherein said means for acquiring environmental data comprise meteorological data detection means (10).
12. The system (100) as claimed in the previous claim, wherein said meteorological data detection means (10) comprise acquisition means selected within a group comprising means for measuring wind velocity and direction, humidity, pressure, air and ground temperature and dew temperature.
- 15 13. The system (100) as claimed in the previous claim, wherein said meteorological data detection means (10) are implementable with sensors for detecting parameters considered necessary for the correct analysis of the phenomenon of thermal variations and of its model of evolution.
- 20 14. The system (100) as claimed in any of the previous claims, wherein said acquisition means comprise location means (11) apt to allow the automatic determination of the geographic co-ordinates of the related local device (1).
15. The system (100) as claimed in any of the previous claims, comprising means (17, 11) apt to determine the geographic co-ordinates of a thermal variation detected by said means (9) for acquiring environmental data.
- 25 16. The system (100) as claimed in any of the previous claims, wherein at least one of said one or more local devices (1) comprises local processing means (17) of the acquired data.
17. The system (100) as claimed in any of the previous claims, wherein at least one of said one or more local devices (1) comprises local storage means (18) of the acquired data.
- 30 18. The system (100) as claimed in any of the previous claims, wherein at least one of said one or more local devices (1) comprises a support structure (3) for supporting said acquisition means (9) having a substantially tripod shape.
- 35 19. The system (100) as claimed in the previous claim, wherein said support structure (3) comprises a platform (6) positioned in correspondence with an upper portion of the structure itself.
20. The system (100) as claimed in any of the previous claims, wherein at least

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one of said one or more local devices (1) is apt to be installed also on a trestle.

21. The system (100) as claimed in any of the previous claims, wherein at least one of said one or more local devices (1) comprises a rotatable platform (93) for supporting said acquisition means (7, 8, 9, 10).
- 5 22. The system (100) as claimed in any of the previous claims, wherein at least one of said one or more local devices (1) comprises self-powering means (13, 14).
23. The system (100) as claimed in any of the previous claims, wherein said intervention plan contains the indication of at least one optimal access path for reaching the area involved by a critical thermal variation.
- 10 24. The system (100) as claimed in any of the previous claims, wherein said intervention plan contains an estimate of the starting and/or ending times of the intervention.
25. The system (100) as claimed in any of the previous claims, wherein said central control station (101) comprises interface means (104) to allow the operators to select an intervention plan and wherein said integrated processing means (103) are apt to adaptively modify said model of evolution of the thermal front according to the intervention plan selected by the operators of said central control station (101).
- 15 26. The system (100) as claimed in any of the previous claims, wherein said integrated processing means (103) comprise means apt to classify the detected thermal variation according to a danger index.
- 20 27. The system (100) as claimed in any of the previous claims, wherein said central control station (101) comprises interface means (104) apt to communicate to the operators the data acquired by the one or more local devices (1) and the output data from said integrated processing means (103) and apt to allow the interrogation of said storage means (102).
- 25 28. The system (100) as claimed in any of the previous claims, wherein said central control station (101) comprises interface means (104) apt to allow the management of said acquisition means (7, 8, 9, 10) of the one or more local devices (1) by the operators of said central station.
- 30 29. The system (100) as claimed in any of the previous claims, comprising means (105) for communicating with agencies for implementing said intervention plan.
30. A method for environmental monitoring, comprising the phases of:
- 35 (a) installing on the territory to be monitored means (7, 8, 9, 10) for acquiring environmental data, apt to detect the presence of a critical thermal variation in the surrounding area;
- (b) storing in a central control station (101) logistical-technical data and data about

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the available intervention means relating to the monitored environment; and
(c) processing, in an integrated mode, the acquired environmental data and the
stored logistical-technical data in such a way as to provide a model of evolution
of the thermal front consequent to a critical thermal variation and an
intervention plan for limiting the damages associated therewith.

31. The method as claimed in claim 30, wherein said phase (a) provides for
installing a plurality of acquisition means (7, 8, 9, 10) distributed in the
environment to be monitored.
32. The method as claimed in claim 30 or 31, wherein said acquisition means
comprise means (9) for detecting energy emissions in the infrared range.
33. The method as claimed in the previous claim, comprising a phase of
processing the energy emissions detected by said detection means (9) wherein the
acquired data are analysed on a plurality of emission bands.
34. The method as claimed in any of the claims from 30 to 33, wherein said phase
(a) provides for the acquisition of images.
35. The method as claimed in the previous claim, wherein said phase (a) provides
for the acquisition of images in the visible range.
36. The method as claimed in claim 34 or 35, wherein said phase (a) provides for
the acquisition of images in the infrared range.
37. The method as claimed in any of the claims from 34 to 36, comprising of
phase of transmitting data from said acquisition means (9) to said central control
station (101) that provides for the transmission of images in a visible and/or
infrared mode.
38. The method as claimed in any of the claims from 30 to 37, wherein said
means for acquiring environmental data comprise meteorological data detection
means (10).
39. The method as claimed in any of the claims from 30 to 38, comprising a
phase of determining the geographic co-ordinates of a thermal variation detected
by said means (9) for acquiring environmental data.
40. The method as claimed in any of the claims from 30 to 39, wherein said
intervention plan contains the indication of at least one optimal access path for
reaching the area affected by a critical thermal variation.
41. The method as claimed in any of the claims from 30 to 40, wherein said
intervention plan contains an estimate of the starting and/or ending times of the
intervention.
42. The method as claimed in any of the claims from 30 to 41, wherein said phase
(c) provides for an adaptive modification of the evolution model of the thermal

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front according to the intervention plan selected by the operators of said central control station (101).

43. The method as claimed in any of the claims from 30 to 42, wherein said phase (c) provides for classifying the detected thermal variation according to a danger index.

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SYSTEM AND METHOD FOR TERRITORY THERMAL MONITORINGDESCRIPTION

The present invention relates to an environment monitoring system and to a related method.

5 In particular, the invention relates to an integrated system for detecting critical thermal levels in the environment. In a specific application thereof, the invention provides a system for detecting fires within wooded areas. In alternative applications, the invention generally relates to a system for detecting critical thermal variations in any type of environment, and in particular in industrial facilities, buildings and so on.

10 Temperature is a very important parameter in many fields. For instance, in industrial facilities temperature can influence the correct operation of plants and equipment. Moreover, in any field a temperature rise can lead to fires or, in fact, indicate the presence of flames.

15 Although safety systems are known which are able to measure temperature in environments that are potentially at risk of thermal damage, the starting and spreading of fires out of natural or induced causes is a very widespread problem today, entailing a dramatic impact on the environment and having serious economic implications. For instance, in the field of forestry, in spite of the efforts expended to improve the timeliness and effectiveness of extinguishing operations, every year fires
20 destroy very large portions of wooded areas.

The technical problems constituting the basis for the present invention, therefore, is to provide an environment monitoring system and a related method that allow to improve the rapidity and effectiveness of operations aimed at limiting and/or containing damages in case of critical temperature rise and in particular of operations
25 for extinguishing a fire event.

Said problem is solved by a system as claimed in claim 1.

According to the same inventive concept, the present invention also relates to a method according to claim 30.

30 In the present context, the expression "environment monitoring" is to be construed in the broad sense, as referred to the monitoring of any kind of environment, in particular wooded areas, natural parks, agricultural areas, civil areas, military areas, industrial areas, specific facilities and/or buildings and/or areas delimited thereby, and so on.

35 Moreover, the term "critical temperature variations" herein indicates temperature variations apt to cause damages in the monitored environment, for instance variations that indicate the onset of a fire.

The present invention provides some important advantages. The main advantage is

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